

# After-sales Service Instructions

## Testing

42

VDT-W-420/300 B  
Ed. 1

## Mechanical Governor

0 420 081... - RW... MW...

**BOSCH** After-sales Service  
Automotive  
Equipment

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## 1. Introduction

This instruction manual describes the adjusting and testing of Bosch mechanical governor RW .. MW ..

The construction and operation of this governor are described in Technische Mitteilung VDT-BEP 102/1 B < VDT-J-403/1 B >.

The sequence of illustrations and accompanying text given here represents the most effective sequence of the individual steps.

Special testing equipment and tools required for testing and adjusting work are listed in Section 2.

The individual measurement points on the governor operating characteristic curves are given on Page 10 (fold-out).

## 2. Test Equipment and Tools

| Test Equipment<br>Tool                                                                            | Part Number<br>Type                            | Use                                                   |
|---------------------------------------------------------------------------------------------------|------------------------------------------------|-------------------------------------------------------|
| Test equipment                                                                                    | see<br>VDT-WPP 110/2B<br>(such as PES .. M ..) |                                                       |
| 1 Clamping bracket                                                                                | 1 688 010 010<br>EFEP 157                      | for test bench<br>with shaft<br>height = 125 mm       |
|                                                                                                   | 1 688 010 011<br>EFEP 157 A                    | shaft height<br>= 110 mm                              |
| 1 Flange                                                                                          | 1 685 720 018<br>EFEP 157/6                    | PES .. with<br>3-hole flange                          |
|                                                                                                   | 1 685 720 017<br>EFEP 157/4                    | PES .. with<br>4-hole flange                          |
| with ring                                                                                         | 1 680 202 005<br>EFEP 29/0/3                   | Pilot dia.<br>68 mm                                   |
| 1 Mounting device                                                                                 | 1 688 030 111                                  | PE with cradle<br>mounting                            |
| 1 Setting device                                                                                  | 0 681 440 006<br>EFEP 56 C                     |                                                       |
| 1 Dial indicator<br>measurement range<br>30 mm<br>graduations 1/10 mm<br>(without return springs) | 1 687 233 015<br>EFAW 144                      | for control-rod<br>travel measuring-<br>device        |
| Socket wrench,<br>complete                                                                        | KDEP 1063                                      | for stop<br>(Part 70) and<br>for locking              |
| Socket wrench,<br>complete                                                                        | KDEP 1064                                      | for spring retain-<br>er (Part 30) and<br>for locking |

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Printed in the Federal Republic of Germany.  
Imprimé en République Fédérale d'Allemagne  
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(9.75)

The location numbers given in parentheses in the text are given on the cross-sectional drawings of the governor on Page 10 (fold-out) and are also identical to the location numbers in the Service Parts List.

The numbers given in circles are the adjustment points cited in the test specification sheet which are shown on the governor operating characteristic curves on Page 10 (fold-out).

### 3. Preparations

Clamp the fuel injection pump together with governor in place for testing, and make the preliminary adjustments (port closing, fuel delivery according to Section "A" in the test specification sheet), as described in VDT-WPP 116/1 B.

**Add engine oil!**

Close the overflow valve at the suction gallery return flow hole. Set the suction gallery pressure at 1 bar (with scavenging).

Unscrew the covers (80 and 52).

Unscrew the stop (81) and move the outer full-load stop (not shown) all the way back.

Mount Setting Device EFEP 56 C on the test bench and align it.

If there is a support thread (M 8), on the governor housing, a homemade support bracket with spacer piece (see Section 8) must be mounted between the injection pump and the test bench.

Mount the control-rod travel measuring device to the governor housing. Screw the threaded pin with magnet into the control rod (Fig. 1).

Move the control rod several times from "Stop" to the full-load position with the control lever.

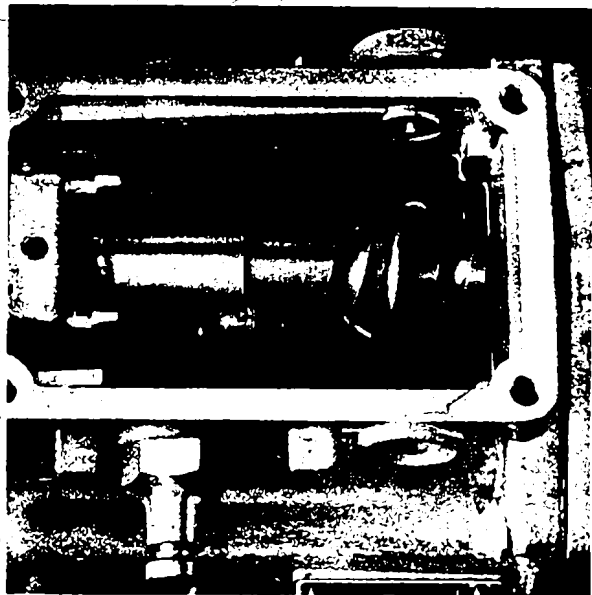
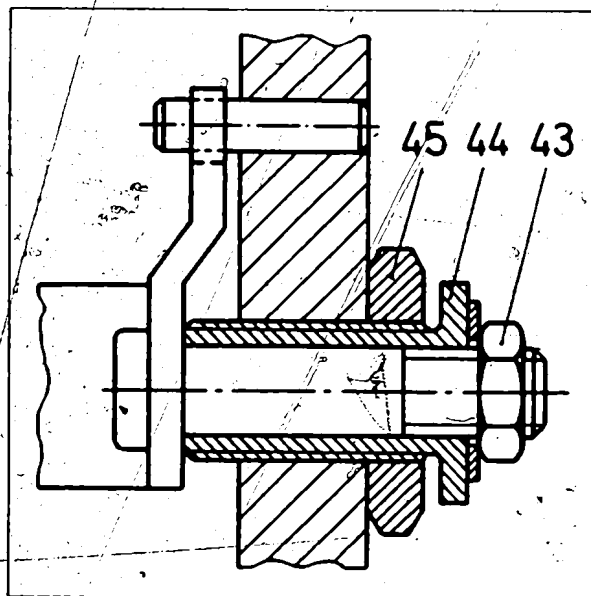
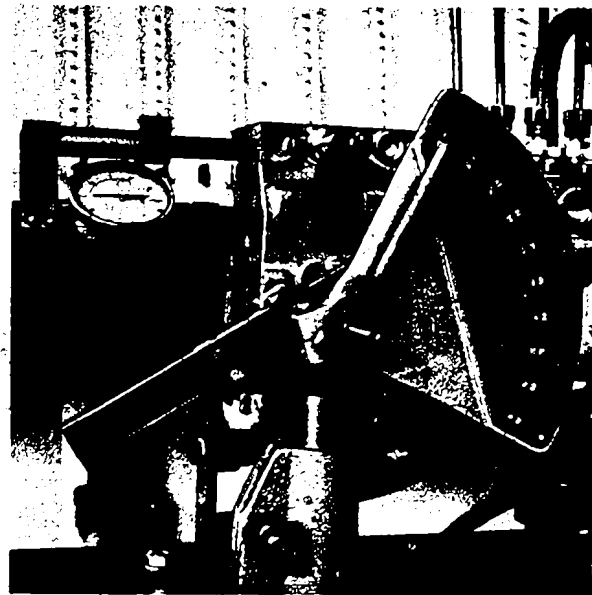
Pull the control rod up against the shutoff stop and set the dial indicator to "0". At control rod travel "0" set the indicator on Setting Device EFEP 56 C to "0".

Completely pretension both the governor spring (49) with adjusting screw (28) and the idle spring with adjusting screw (29). Turn adjusting screw (3) all the way inward. Unscrew the idle auxiliary spring (spring capsule) (70).

Screw the adjusting screw (44) for the follower lever right in – to do this release the hexagon nuts (43, 45) (Fig. 2). Then retighten the hexagon nuts.

Set the governor spring to the center position of the adjusting shaft (48) (Fig. 3).

Mount the cover (52) together with seal.





#### 4. Adjust the Governor

##### 4.1 Adjust the spring retainer (compensation capsule) and driver (30)

Screw in the spring retainer and driver screw with Pin Wrench KDEP 1064/1 or a 1/2" hexagon-socket screw key until the retainer is brought up against the sliding sleeve (72). Do not apply too much pressure to the spring retainer! The lock nut must not be pressed against the tensioning lever (26) (Fig. 4). Then adjust the sleeve idle travel (mm) to the value given in the test specification sheet by turning the spring retainer and driver outward (1 turn corresponds to 1 mm).

##### 4.2 Measure the starting control-rod travel and starting fuel delivery: (Section B ⑫, C ⑫a)

The starting control-rod travel ⑫ must be reached at the prescribed speed and with the control lever placed forward. Measure the starting fuel delivery ⑫ at the prescribed speed ⑫a.

##### 4.3 Adjust the lower nominal speed: (Test specification sheet, Section B ②)

Adjust the control lever deflection (Section B, Column 1) and fix it in this position.

Release the tension on the idle leaf spring (32) using the adjusting screw (29) until the control-rod travel ② given is reached at the prescribed speed.

##### 4.4 Check loading: (Section B ①)

At the prescribed speed the control-rod travel given must be reached. If the prescribed value is not reached, the basic setting of the sleeve position should be checked — see VDT-W-420/100 B, Page 5 — or the idle spring should be replaced and the governor parts checked for mechanical defects.

##### Note:

If the measurement values (control-rod travel) prescribed for the control points cannot be attained, the idle spring must be replaced.

#### 4.5 Adjust idle auxiliary spring (70): (Section B, ③)

At the speed given, screw in the idle auxiliary spring (spring capsule), using Socket Wrench KDEP 1063, until the prescribed control-rod travel is attained (Fig. 5).

#### 4.6

When making the following idle and full-load fuel delivery adjustment and the following measurements of variations in fuel delivery, be sure that the maximum permissible difference in fuel delivery given in Section A, Column 4, of the test specification sheet is not exceeded.

The fuel delivery given in Section C of the test specification sheet is the average value for all plunger and barrel assemblies in each case.

#### 4.7 Measure the lower idle fuel delivery: (Section C ⑤)

Set the speed ① and measure the fuel delivery.

A correction can be made by turning the barrel and valve assembly.

Observe Section 4.6 above!  
Adjust the idle stop screw (81) and lock it in position.

#### 4.8 Check idle stop: (Section B, ⑤)

Check the control-rod travel at the speed given. If the prescribed value is not reached, the compensation capsule can be shifted slightly. If there is a wide deviation from the nominal value, check that operation conforms with Section 4.1 above.

#### 4.9 Adjust full-load control-rod travel: (Section B ①) and measure fuel delivery: (Section C ⑥)

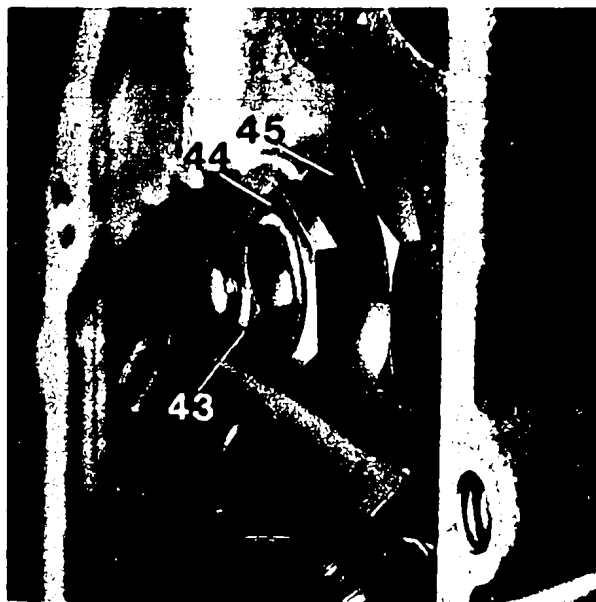
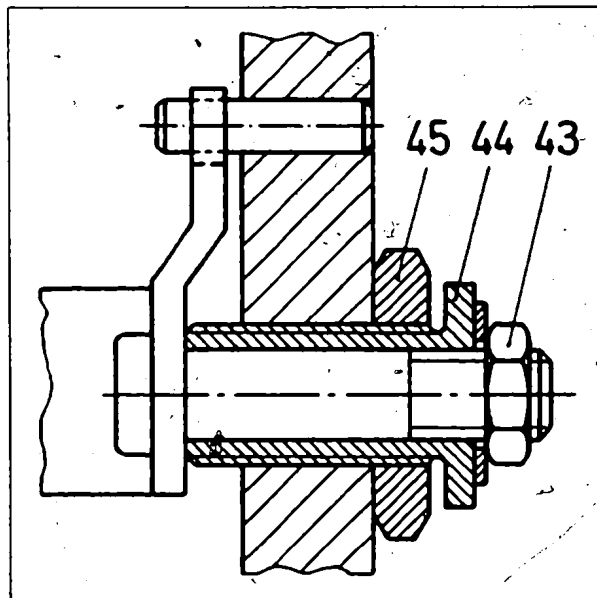
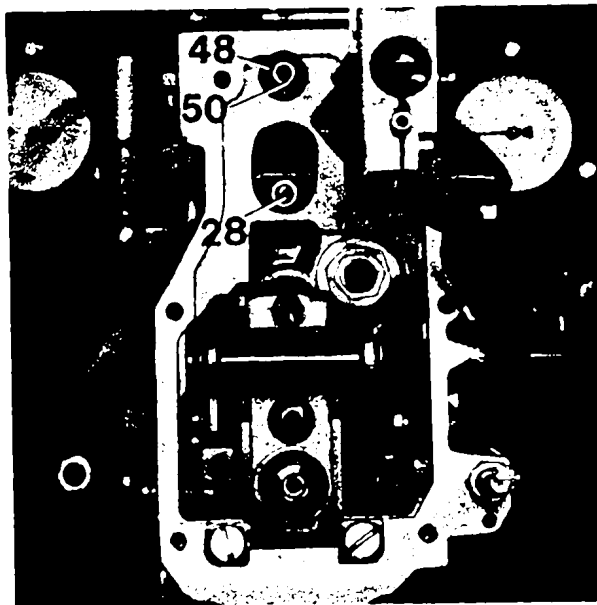
At the prescribed speed ①, move the control lever toward "Voll" ("Full") until the prescribed control-rod travel is attained. The "control-rod deflection" attained must correspond to the angle prescribed in the test specification sheet (permissible tolerance  $\pm 4^\circ$ ).

Measure the full-load fuel delivery and correct it if necessary by turning the barrel and valve assembly — be sure to observe the idle fuel delivery and Section 4.7 above while doing this!

Set the outer full-load stop and lock it in place.



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## 4.10 Adjust full-load speed regulation

### 4.10.1 Adjust breakaway: (Section B ①)

Adjust the governor spring (49) using the adjusting screw (28) until the prescribed control-rod travel is reached at the speed given.

### 4.10.2 Adjust the speed droop: (Section B ⑨)

The prescribed control-rod travel must be attained at the speed given. This travel can be corrected by turning the adjusting shaft (48) — for this purpose remove the tapered screw (50) (Fig. 6).

Control-rod travel too high = turn adjusting shaft to the left,  
control-rod travel too low = turn adjusting shaft to the right.

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#### Important note:

After turning the adjusting shaft (48), readjust the breakaway (Section 4.10.1 above).

Replace the tapered screw.

### 4.10.3 Measure the upper idle fuel delivery at the speed given: (Section C ⑥)

### 4.10.4 Check end of regulation: (Section B ⑩)

Control-rod travel "0" must be reached at the speed given.

## 4.11 Test variations in control-rod travel and adjust travel: (Section B ⑪ ⑫)

(The control lever is up against the full-load stop.)

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### 4.11.1

As the speed is decreasing, check the control-rod travel at measurement point (compensation) ⑪.

If the proper value at measurement point ⑪ is not attained, the spring retainer (30) must be replaced. If the spring retainer is replaced, a readjustment is required.

### 4.11.2

At the speed under Point ⑫, bring the follower lever up against the torque cam by unscrewing the adjusting screw (44) — for this purpose release the hexagon nuts (43, 45). Observe the dial indicator (Figs. 7 and 8)

If the control-rod travel measured is higher than the value prescribed at Point ⑫, this travel can be adjusted by turning the adjusting screw (44) outward.

If the travel measured is less than the value prescribed at Point ⑫, the spring retainer (30) must be replaced, and as a result the governor must be readjusted.

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#### 4.12 Measure variations in fuel delivery: (Section C ⑰ ⑱)

Set the speed given and measure the fuel delivery.

#### 4.13 Adjust start locking (Section B ⑤)

As the speed is decreasing, and with simultaneous movement of the control lever back and forth from "Stop" to the full-load stop.

The switching point of the start locking mechanism is reached when a considerable increase in control-rod travel occurs compared with the full-load control-rod travel.

The adjustment is made at the adjusting screw (3) with lock nut (Fig. 9).



### 5. Concluding Work

Mount the rear cover (80) together with a new seal and hook the pneumatic shutoff device to the control rod if the governor is fitted with this device – for this purpose unscrew the cover (52) (Fig. 10).

Check the stop chamber for proper operation:  
At a vacuum of 0.5 bar (375 mm Hg), the pneumatic shutoff device must pull the control rod to the "0" travel position.

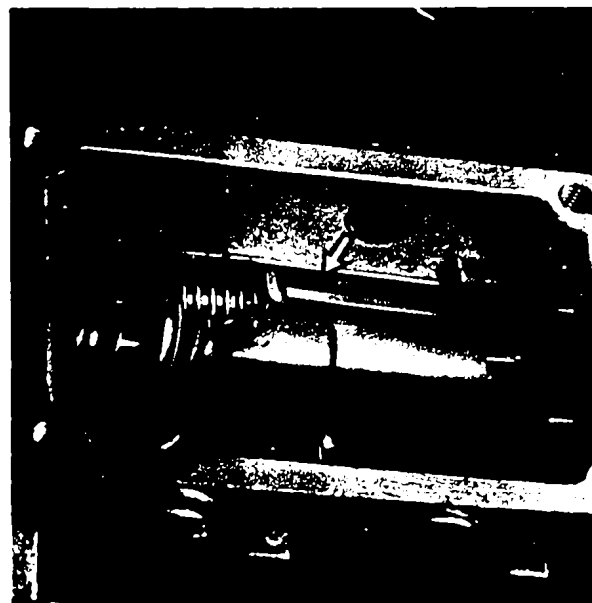
Mount the cover (52) and the fuel pump together with a new seal.

Remove the injection pump from the test bench.

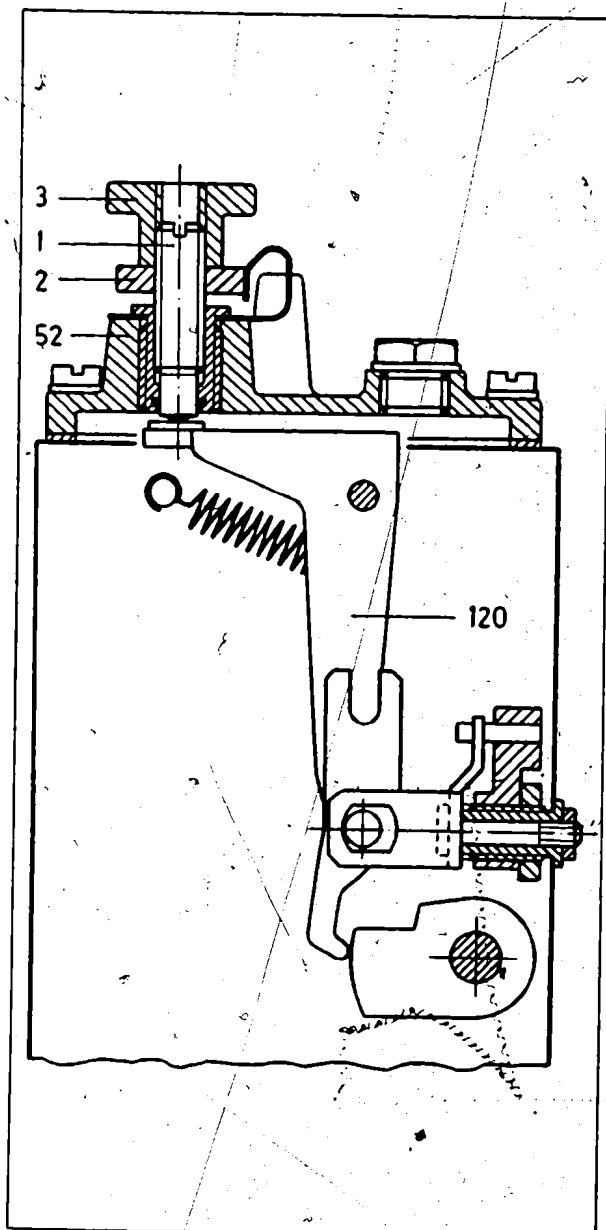
Test the injection pump, together with governor, for leaks.

Close the oil feed and return lines or the return flow hole (dia. 8) on the side of the bearing end-plate with plugs (for example, 1 900 508 003).

Attach a homemade connector fitting (thread length less than 9 mm) to the threaded joint at the first roller tappet (bore hole for prestroke measurement) M 16 x 1.5. Test pressure: 0.5 bar gauge pressure (0.5 km/cm<sup>2</sup>).



If the governor is fitted with a pneumatic shutoff device, this device must also be closed.  
In order to test the diaphragm for leaks, a hose is placed over the connector fitting and is tested for leaks in an oil bath. The diaphragm must be absolutely leak-proof, i.e., no air must come out of the hose. Seal the injection pump and governor.



## 6. Adjusting Type RW Governor with Reduced-Fuel-Delivery Stop

This governor is fitted with a reduced-fuel-delivery stop (52) instead of the cover (52) (see fold-out). The follower lever installed in the governor is mounted onto the correction lever (120) in such a way that it can move.

When adjusting this governor the following should be observed:

### 1. Supplement to text in Section 3 "Preparations" above.

Supplement to text after "Mount the cover (52) together with seal." (At end of section).

Release the knurled nut (3) — when doing this apply counterpressure to the indicator plate (2) with a wrench (SW 27) (Fig. 11).

Screw out the adjusting screw (1) about 3 turns in a counterclockwise direction.

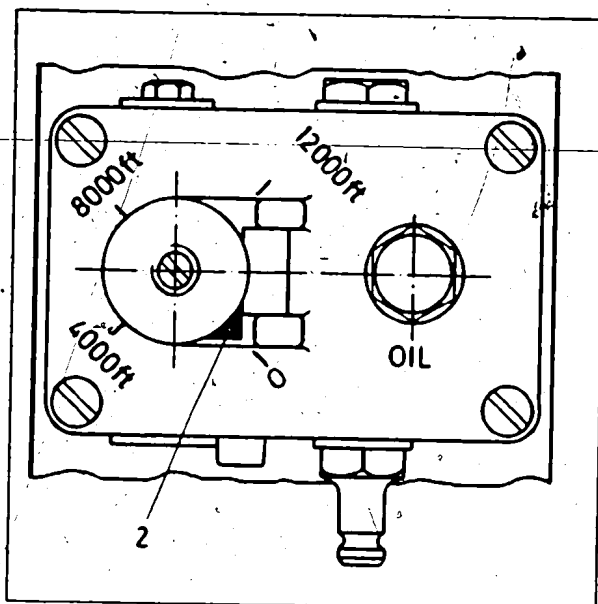
Lock the indicator plate in place with the knurled nut.

### 2. Supplement to text in Section 4 "Adjust the Governor".

Supplement to text before Section 4.12. Set the indicator plate to notch position "0" (Fig. 12).

Set the rotational speed associated with Point ④ in the test specification sheet. Release the knurled nut and screw in the adjusting screw until the correction lever (120) is touched; observe the control-rod travel dial indicator while doing this.

Then fix the adjusting screw in the above-mentioned position by locking the knurled nut and indicator plate.

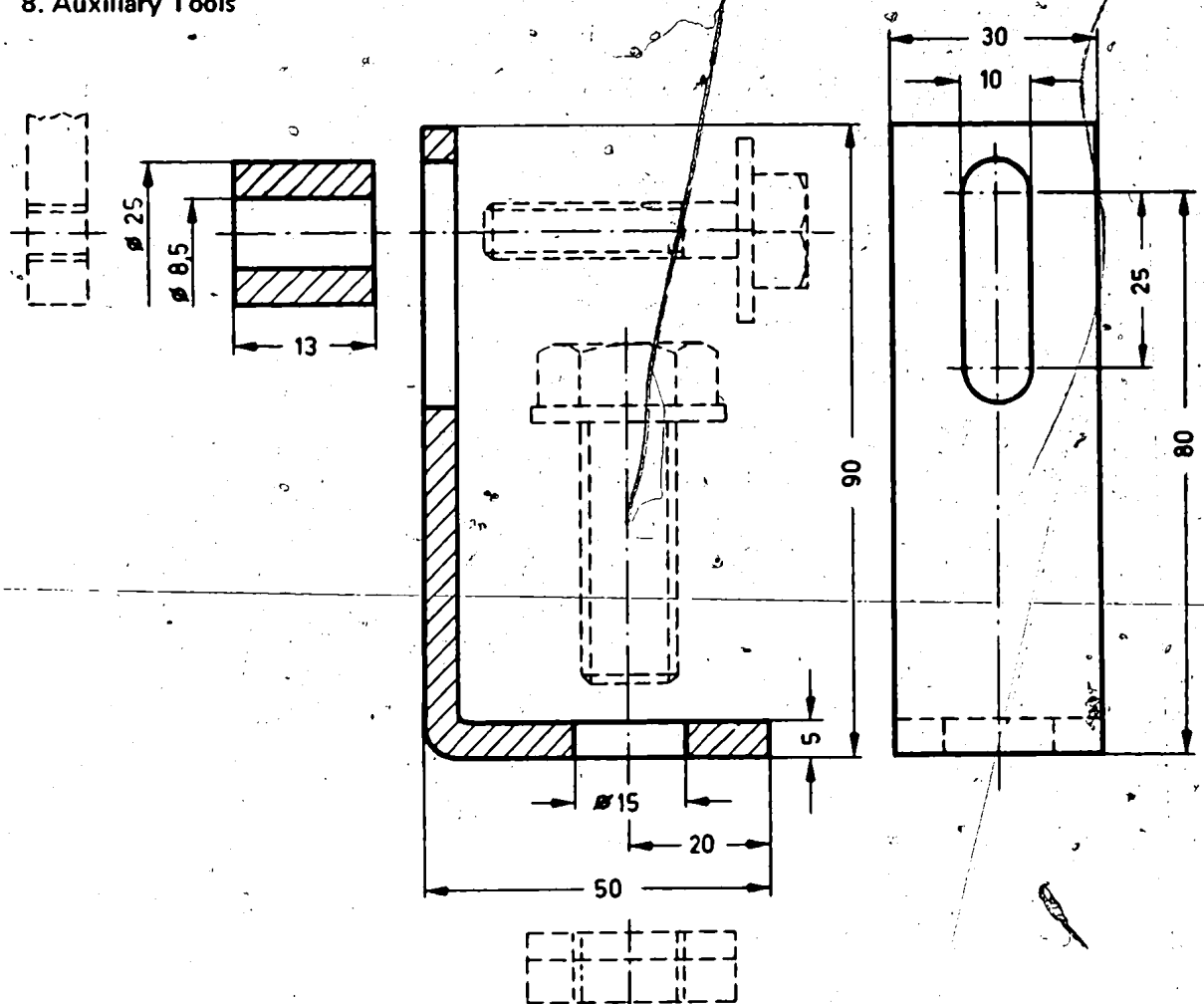


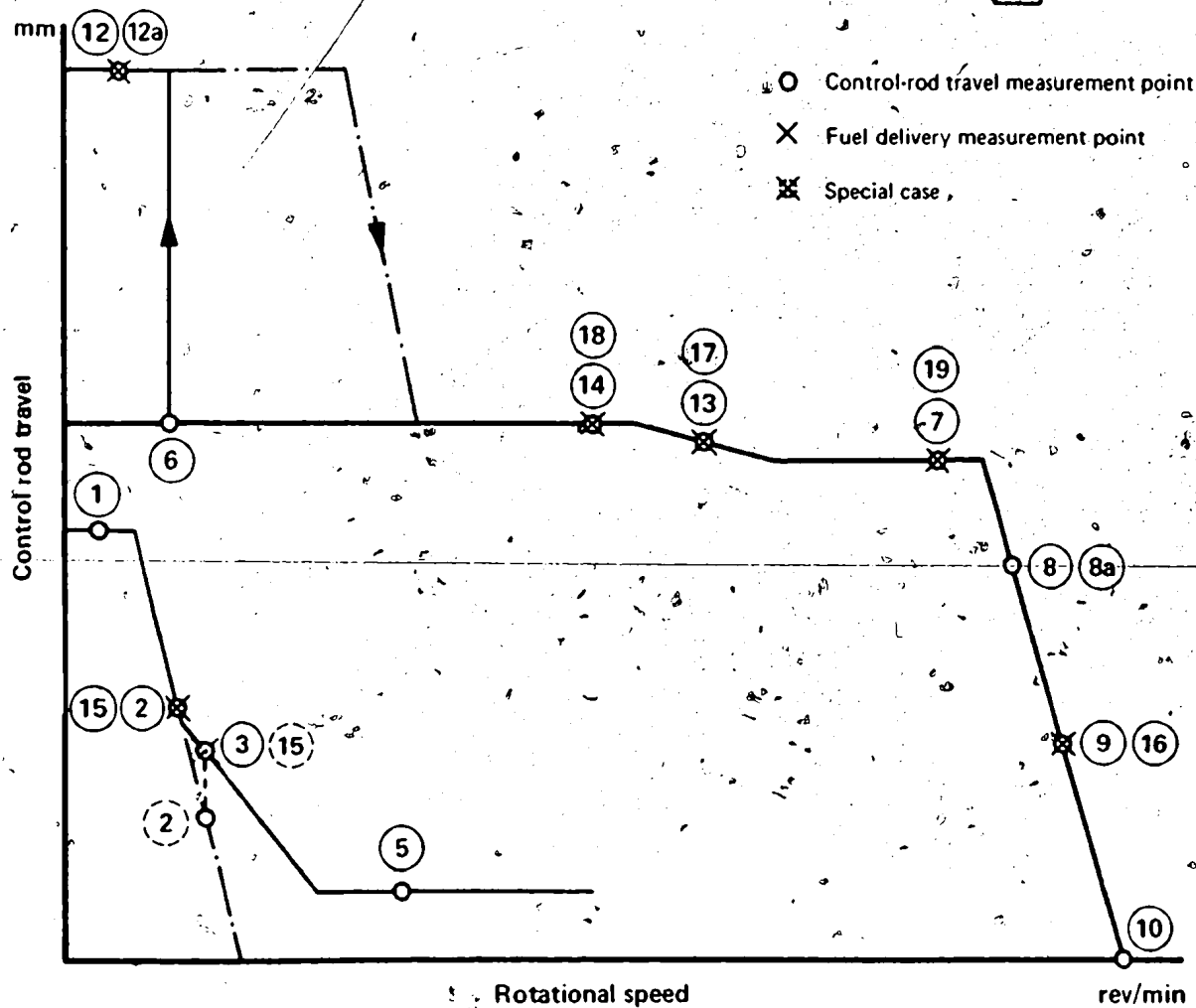
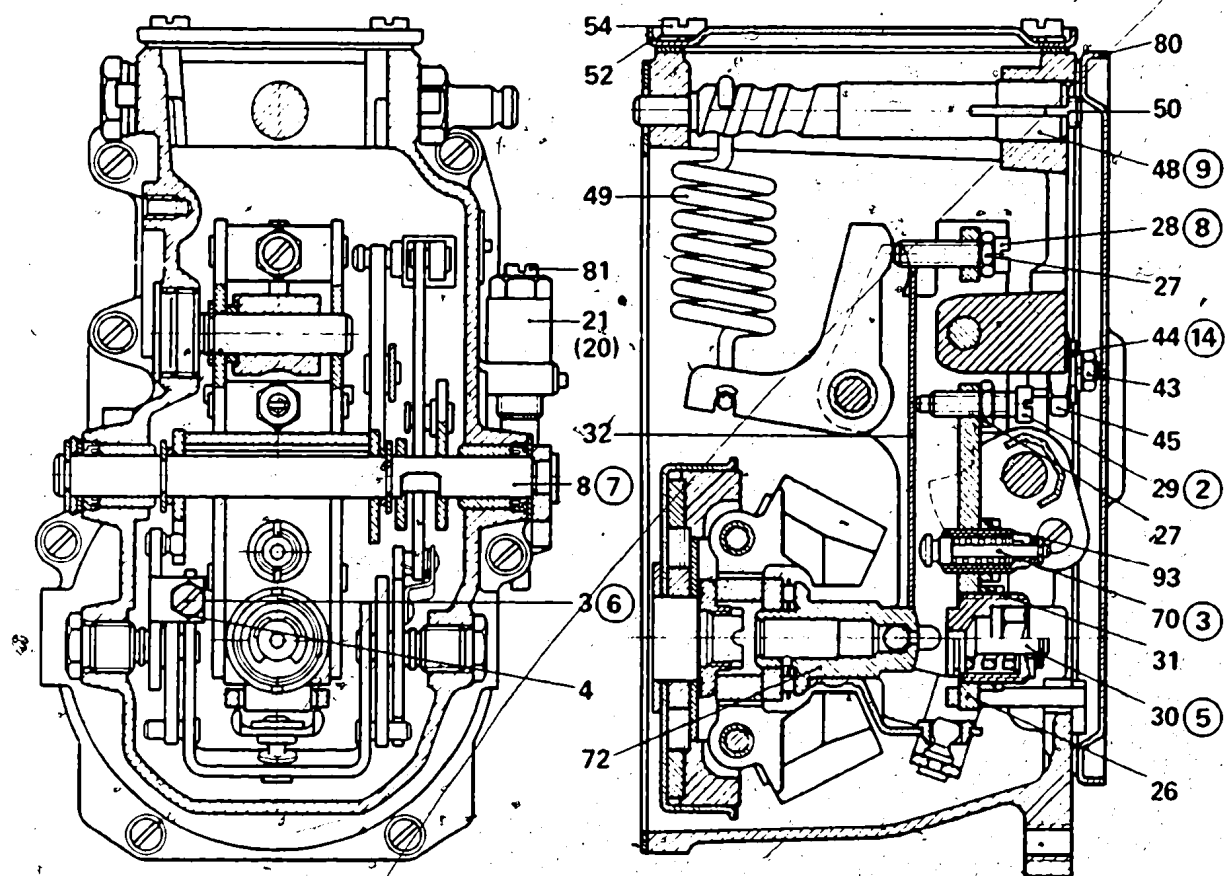


## 7. Tightening Torques

| Part No. | Designation                  | N.m     | kpm       |
|----------|------------------------------|---------|-----------|
| 4        | Hexagon nut                  | 3 - 4   | 0.3 - 0.4 |
| 21 (20)  | Retaining nut or hexagon nut | 15 - 17 | 1.5 - 1.7 |
| 27       | Hexagon nut                  | 6 - 9   | 0.6 - 0.9 |
| 31       | Round nut                    | 30 - 35 | 3.0 - 3.5 |
| 43       | Hexagon nut                  | 7 - 9   | 0.7 - 0.9 |
| 45       | Hexagon nut                  | 20 - 23 | 2.0 - 2.3 |
| 50       | Screw plug                   | 6 - 8   | 0.6 - 0.8 |
| 54       | Fillister head screw         | 3 - 5   | 0.3 - 0.5 |
| 93       | Round nut                    | 13 - 15 | 1.3 - 1.5 |

## 8. Auxiliary Tools





# ⑤ Test Specifications Fuel Injection Pumps and Governors

40

supersedes  
company  
engine

All test specifications are valid for Bosch Fuel Injection Pump Test Benches and Testers

## A. Fuel Injection Pump Settings

Port closing at prestroke

mm, (from BDC)

Control rod travel

| Rotational speed<br>rev/min | Control rod<br>travel<br>mm | Fuel delivery<br>cm <sup>3</sup> /100 strokes | Difference<br>cm <sup>3</sup> /100 strokes | Control rod<br>travel<br>mm | Fuel delivery<br>cm <sup>3</sup> /100 strokes | Spring pre-tensioning<br>(compensating valve)<br>mm |
|-----------------------------|-----------------------------|-----------------------------------------------|--------------------------------------------|-----------------------------|-----------------------------------------------|-----------------------------------------------------|
| 1                           | 2                           | 3                                             | 4                                          | 2                           | 3                                             | 6                                                   |
|                             |                             |                                               |                                            |                             |                                               |                                                     |
|                             |                             |                                               |                                            |                             |                                               |                                                     |

Set uniform delivery according to the values in

Checking values in brackets

## B. Governor Settings

| Lower rated speed                              |                             |                             | Upper rated speed                              |                             |                             | Variations in control rod travel |                                |                          |
|------------------------------------------------|-----------------------------|-----------------------------|------------------------------------------------|-----------------------------|-----------------------------|----------------------------------|--------------------------------|--------------------------|
| Degree of<br>deflection<br>of control<br>lever | Control rod<br>travel<br>mm | Rotational speed<br>rev/min | Degree of<br>deflection<br>of control<br>lever | Control rod<br>travel<br>mm | Rotational speed<br>rev/min |                                  | Rotational<br>speed<br>rev/min | Control rod travel<br>mm |
| 1                                              | 2                           | 3                           | 4                                              | 5                           | 6                           | 7                                | 8                              | 9                        |
| ①                                              |                             |                             | ⑦                                              |                             |                             |                                  | ⑫                              |                          |
| ②                                              |                             |                             | ⑧                                              |                             |                             |                                  | ⑬                              |                          |
| ③                                              |                             |                             | ⑨                                              |                             |                             |                                  | ⑭                              |                          |
| ④                                              |                             |                             | ⑩                                              |                             |                             |                                  |                                |                          |
| ⑤                                              |                             |                             | ⑪                                              |                             |                             |                                  | ⑥                              | Switching point          |

## C. Settings for Fuel Injection Pump with Governor Mounted

| Full-load delivery<br>Test oil temp. 40°C (104°F) |                               | Full-load speed<br>regulation |         | Variations in fuel<br>delivery |                               | Starting fuel delivery<br>Idle |                               | Difference                    |
|---------------------------------------------------|-------------------------------|-------------------------------|---------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|-------------------------------|
| rev/min                                           | cm <sup>3</sup> /1000 strokes | rev/min                       | rev/min | rev/min                        | cm <sup>3</sup> /1000 strokes | rev/min                        | cm <sup>3</sup> /1000 strokes | cm <sup>3</sup> /1000 strokes |
| 1                                                 | 2                             | 3                             | 4       | 5                              | 6                             | 7                              | 8                             |                               |
|                                                   |                               |                               |         |                                |                               |                                |                               | ⑫a                            |
|                                                   |                               |                               |         |                                |                               |                                |                               | ⑮                             |
|                                                   |                               |                               |         |                                |                               |                                |                               | ⑯                             |

Checking values in brackets

\* 1 mm less control rod travel than in Column 2

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by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50 Printed in the Federal Republic of Germany  
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

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Archiv/VDT

**42**

VDT-W-420/300 B  
Suppl. 1  
Ed. 1

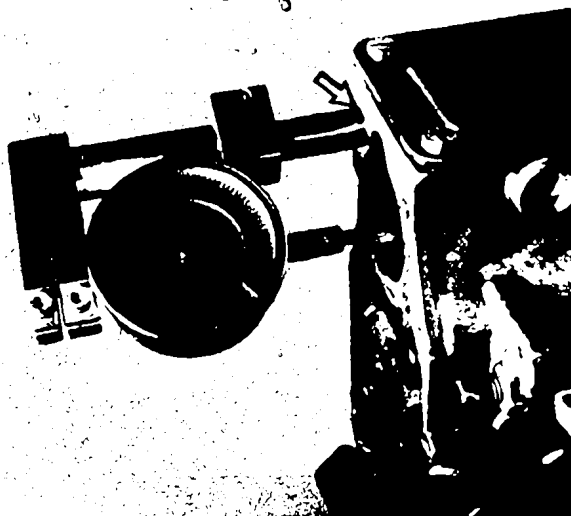
## **Mechanical Governor**

0 420 081 ... - RW ... MW ...

**BOSCH** After-sales Service  
Automotive  
Equipment

## 1. Introduction

This 1st supplement describes preparations for testing the RW .. MW .. mechanical governor with 7-hole flange and contains an explanation regarding item 4.10.2.



## 3. Preparations

For RW .. MW .. with 7-hole flange.

The governor must be prepared for testing on the basis of the existing test instructions, up to the paragraph "Mount the control-rod-travel measuring device to the governor housing". With these governors, the control-rod-travel measuring device is attached to the top right-hand (viewed from the drive end) fastening thread (Fig. 1).

Since the stem of the dial indicator no longer contacts the threaded pin with magnet exactly in the center, it must be ensured that the stem rests flat against this pin.

### 4.10.2 Adjustment of speed droop

Item 4.10.2, page 6, "Adjust the speed droop", no longer applies (the adjusting shaft does not have a spiral spline for adjusting the speed droop).

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# After-sales Service Instructions

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## Testing

**42**

VDT-W-420/300 En  
Suppl. 2  
Ed. 2

## Mechanical Governors

O 420 081 .. - RW .. MW ..

with combined atmospheric and manifold-pressure compensator (ALDA)  
or altitude pressure compensator (ADA)

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## 1. Introduction

### 1.1 Design and operation

See publication VDT-I-403/2 En.  
One must be familiar with this publication before repairs can be carried out correctly.  
The operation of the control linkage for both ADA and ALDA is identical.

1.2 The various measurement points are marked in on the governor characteristic curve on Page 10.

1.3 The position numbers occurring in the text, refer to the sectional drawing on Page 11.

1.4 Ringed figures refer to the adjustment points in the Test Specification Sheet (see 1.2).

| Test Equipment Tool                                                           | Part. No.                   | Application                               |
|-------------------------------------------------------------------------------|-----------------------------|-------------------------------------------|
| Support bracket                                                               | see VDT-W-420/300 En Page 9 | for supporting the pump on the test bench |
| Pressure regulating valve for compressed air, with pressure gauge 0 ... 4 bar | commercially available      | for testing with pressure applied         |
| Pressure gauge 0 ... 1.6 bar quality grade 1.0 graduations 0.05               | commercially available      | for testing with pressure applied         |

## 2. Test equipment and tools

| Test equipment Tool                                                                          | Part No.                       | Application                                                             |
|----------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------|
| Test equipment                                                                               | see VDT-W-400/305              |                                                                         |
| 1 clamping bracket                                                                           | 1 688 010 010<br>1 688 010 011 | for test benches with shaft height of 125 mm<br>shaft height of 110 mm. |
| 1 flange                                                                                     | 1 685 720 018<br>1 685 720 017 | PES ... with 3-hole flange<br>PES ... with 4-hole flange                |
| with ring                                                                                    | 1 680 202 005<br>EFEP 29/0/3   | Pilot dia. 68 mm                                                        |
| 1 clamping support                                                                           | 1 688 030 111                  | PE ... with cradle mounting                                             |
| 1 setting device                                                                             | 0 681 440 006<br>EFEP 56 C     | for fixing the control lever                                            |
| 1 dial indicator effective measuring range 30 mm graduations 1/10 mm (without return spring) | 1 687 233 015                  | for control rod travel measuring device                                 |
| Socket wrench, complete                                                                      | KDEP 1063                      | for stop (Pos. 70), and for locking                                     |
| Socket wrench, complete                                                                      | KDEP 1064                      | for spring retainer (Pos. 30) and for locking                           |
| 1 vacuum manometer                                                                           | 1 688 130 032                  | for testing with vacuum applied                                         |
| 1 vacuum manometer                                                                           | 0 681 142 001                  | for test benches without integrated vacuum device                       |

## 3. Preparations

Clamping the injection pump to the test bench, and preliminary adjustments (as per Section "A" of the Test Specifications Sheet), are described in VDT-WPP 116/1 En.

### Fill with engine oil (100 cm<sup>3</sup>)

Close the overflow valve at the return-flow bore of the suction gallery. Suction-gallery pressure 1 bar (with engine oil under circulation).

Unscrew the closing cover (80).

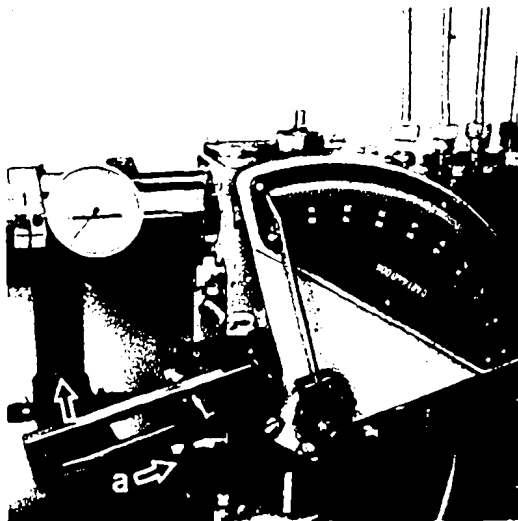
**Aneroid device is not fitted.**

Unscrew stop (81).

Move the rear full-load stop (19) all the way back.

Fit the adjusting device (EFEP 56 C) on the test bench and align it.





#### Governor housing with support thread:

Fit the support bracket together with the spacer piece (Arrow "a" in Fig. 1) (see VDT-W-420/300 En, Page 9).

Fit the control-rod-travel measuring device 1 688 130 134 to the governor housing.

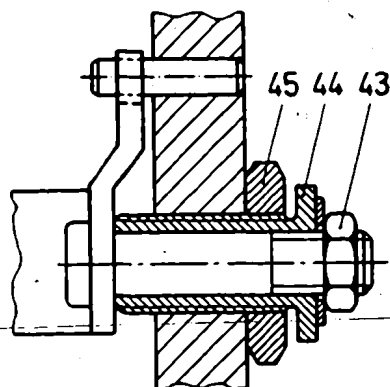
Clamp the dial indicator in the control-rod-travel measuring device.

Screw the threaded pin with magnet into the control rod.

Using the control lever, move the control rod several times from the "Stop" position to the full-load position.

Pull the control rod up against the shutoff stop and set the dial indicator to "0".

Move the control lever in the direction "full load" until a control-rod travel of 0.1 mm is indicated. In this position set the pointer of the setting device (EFEP 56 C) to "0".



Completely pretension both the governor spring (49) with the upper adjusting screw (28), and the idle spring with the lower adjusting screw (28).

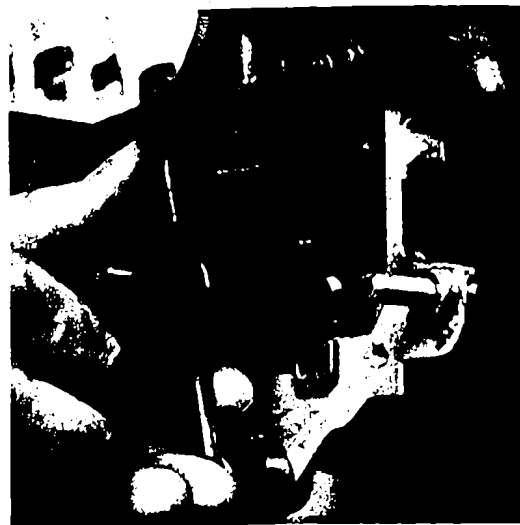
Turn the adjusting screw (3) all the way in.

Unscrew the idle-speed auxiliary spring (70) all the way out.

Loosen the hexagon nuts (43, 45).

Screw the adjusting screw (44) for the follower lever right in.

Now tighten the hexagon nuts (43, 45) again.



#### 4. Adjust the governor without the aneroid device

##### 4.1 Adjust the spring retainer (compensation capsule)

Screw in the spring retainer or the driver screw, using pin wrench KDEP 1064/1, until the spring retainer is brought up against the sliding sleeve (72).

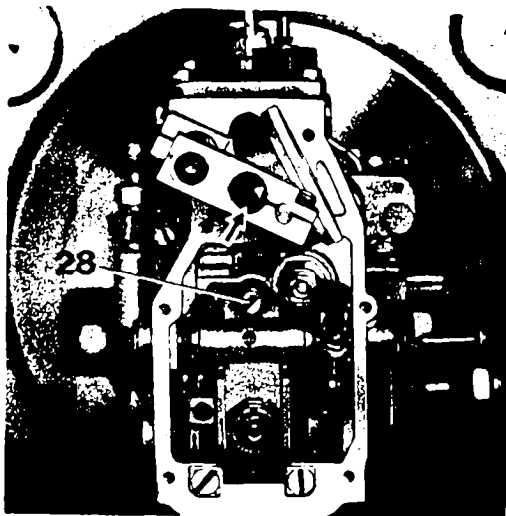
**Do NOT** apply too much pressure to the spring retainer such that the spring is compressed.

The locking nut must not be up against the tensioning lever (26).

Finally, adjust the sliding-sleeve idle travel (mm) to the value given on the rear of the Test Specification Sheet by turning out the spring retainer, one turn is approximately 1 mm.

##### 4.2 Measure the starting control-rod travel and starting fuel delivery: (Section B ②; C ②)

The starting control-rod travel must be reached at the speed prescribed, and with the control lever pushed forward. Measure the starting fuel delivery ② at the prescribed speed ②.



**4.3 Adjust the lower nominal speed:  
(Test Specification Sheet, Section B ①)**

Adjust the control-lever deflection (Section B, Column 1) and fix it in this position.

Maintaining this position, move the idle stop (81) up against the control lever and lock it.

In doing so, the spring in the spring-loaded stop must not be compressed.

Using the lower adjusting screw (28), release the tension from the idle leaf-spring (32) until the prescribed control-rod travel ② is reached at the speed specified.

**4.4 Check loading:  
(Test Specification Sheet, Section B ①)**

Measure the control-rod travel at the prescribed speed. If the prescribed travel value is not reached, the basic setting of the sleeve position should be checked in accordance with VDT-W-420/100 En, Suppl. 1, Page 7. If necessary, the idle spring is to be replaced and/or the governor parts checked for mechanical defects.

**Note:**

If the measurement values (control-rod travel) prescribed for the control points cannot be attained, the idle spring must be replaced.



**4.5 Adjust the idle-speed auxiliary spring (70):  
(Test Specification Sheet, Section B ①)**

At the speed given, screw in the idle-speed auxiliary spring (spring capsule), using socket wrench KDEP 1063, until the prescribed control-rod travel is attained.

**4.6 Governor with altitude-pressure compensator (ADA) aneroid box:**

**Measure the lower idle fuel delivery:  
(Test Specification Sheet, Section C ①)**

Set the speed ① and measure the fuel delivery.

Correction can be made by turning the barrel-and-valve assembly.

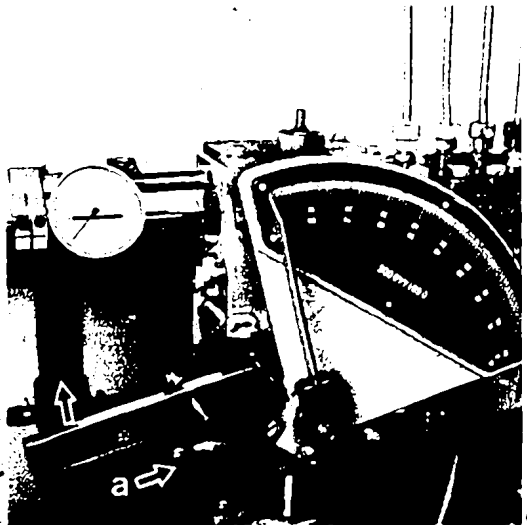
Turning clockwise results in increased delivery.

The following test steps apply to governors fitted with either an altitude-pressure compensator (ADA) aneroid box or a combined atmospheric and manifold-pressure compensator (ALDA) aneroid box.

**4.7 Checking the idle step  
(Test Specification Sheet, Section B ①)**

Check the control-rod travel at the speed given.

Slight deviations can be corrected by adjusting the compensation capsule. If there is a large deviation from the nominal value, check the position of the control lever.



**4.8 Adjust full-load control-rod travel:**  
(Test Specification Sheet, Section B ④, and measure fuel delivery, Section C ⑥)

At the prescribed speed ④, move the control lever towards the full-load position until the prescribed control-rod travel is reached. The control-rod "deflection" attained must correspond to the angle prescribed in the Test Specification Sheet (Tolerance  $\pm 4^\circ$ ).

Measure the full-load fuel delivery; small corrections can be carried out by altering the position of the control lever within the permissible tolerance.

Set the outer full-load stop and lock it.

**4.9 Test control-rod travel characteristic and adjust:**  
(Test Specification Sheet, Section B ③, ①)

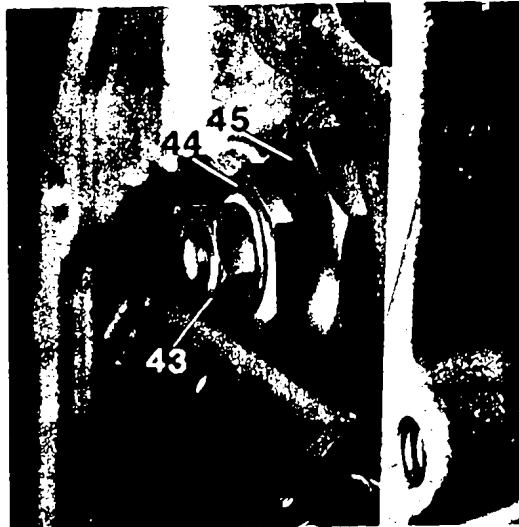
Control lever is up against the outer full-load stop.

**4.9.1**

With increasing speed, check the control-rod travel at measurement point ③ and fuel delivery C ⑦ (torque control). Check the control-rod travel at measurement point ① and fuel delivery C ⑥.

If the correct values are not reached at the measurement points, replace the spring retainer (30).

After the spring retainer has been replaced, readjustment is necessary.

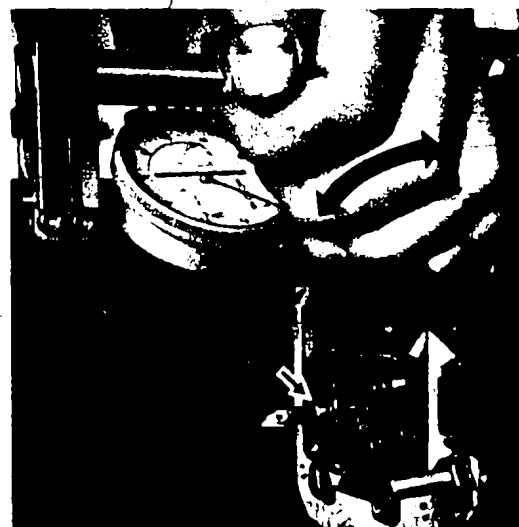


**4.9.2**

Loosen the hexagon nuts (43, 45). At the prescribed speed (see Test Specification Sheet reverse side) bring the follower lever up against the rocker guide by unscrewing the adjusting screw (44).

If these details are not included on the Test Specification Sheet, bring the follower lever up against the rocker guide at the speed given at ④.

Note the dial indicator!

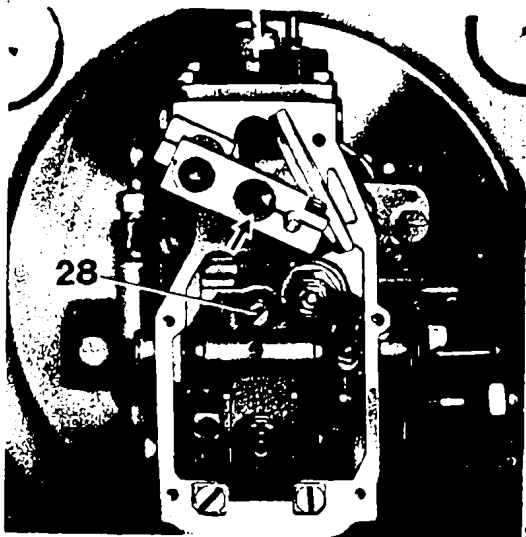


**4.10 Adjusting the start locking**  
(Test Specification Sheet, Section B ④)

With falling speed, and while at the same time moving the control lever back and forth from "stop" to the full-load stop position.

The switching point of the start-locking mechanism is reached when the travel increases considerably beyond the full-load control-rod travel.

Correct at the adjusting screw (3).



#### 4.11 Adjust full-load speed regulation:

##### 4.11.1 Adjust breakaway: (Test Specification Sheet, Section B ①)

Adjust the governor spring (49) using the upper adjusting screw (28 arrow), until the prescribed control-rod travel is reached at the speed given.

##### 4.11.2 Check the speed droop:

Check the speed droop with ADA fitted (Section B ①)  
Check the speed droop with ALDA fitted (Section B ②)

The control-rod travel prescribed in the Test Specification Sheet must be reached at the speed given.

It is not possible to carry out a correction. If the control-rod travel is outside the permissible tolerance, check the control rod for ease of movement.

If necessary, replace the governor spring (49).

##### 4.11.3 Measure the upper idle fuel delivery: (Section C ③)

4.11.4 In the case of governors with ADA:  
Check end of breakaway (Section B ④)

## 5. Adjust the governor when fitted with the aneroid box

### 5.1 Checking and adjusting the governor fitted with the ADA aneroid box:

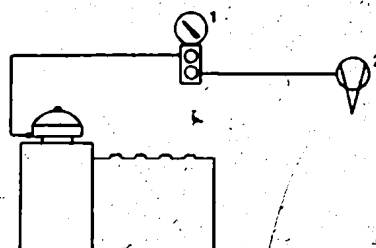
Fit the ADA aneroid box, together with the "selected by measurement" shims (148) (see Repair Instructions VDT-W-420/100 En, Suppl. 1)

Tighten the union nut (52/2) with a torque of 50 ... 70 Nm (5.0 ... 7.0 kgf.m).

Depending upon the prevailing atmospheric pressure, the following test is carried out using either pressure or vacuum.

If the atmospheric pressure (barometer reading) is higher than the absolute pressure as indicated in the Test Specification Sheet, then the test must be carried out using vacuum.  
If the opposite applies, and the atmospheric pressure is lower, then pressure is to be used.

A vacuum unit is incorporated in the following test benches: EFEP 375, 385, 390, 410, 500, 515 and 615.



1 = Setting throttle with pressure gauge  
2 = Vacuum unit

Other test benches can be retro-fitted using the vacuum unit 0 681 142 001 together with the pressure gauge and setting throttle 1 688 130 032.  
(A pressure gauge is required for every test which involves vacuum).

Connect the vacuum unit to the lower connection of the setting throttle.

Connect the upper connection of the setting throttle to the ventilation pipe of the aneroid box.

For the connections required for testing with pressure, see 5.2.1.

Ascertain the exact atmospheric pressure (weather bureau, mercury barometer).

Determine the required gauge pressure or the required vacuum:

**Example for vacuum:**

Setting point, see Test Specification Sheet.

|                                      |            |             |
|--------------------------------------|------------|-------------|
| Atmospheric pressure                 | 1000 mbar  | (730 mm Hg) |
| Setting point<br>(absolute pressure) | - 840 mbar | (630 mm Hg) |
| Required vacuum,<br>setting value    | 160 mbar   | (120 mm Hg) |

**Example for gauge pressure:**

|                                      |            |             |
|--------------------------------------|------------|-------------|
| Setting point<br>(absolute pressure) | 840 mbar   | (630 mm Hg) |
| Atmospheric pressure                 | - 820 mbar | (615 mm Hg) |
| Required gauge pressure              | 20 mbar    | ( 15 mm Hg) |

Drive the injection pump at the speed specified in the Test Specification Sheet.

Move the control lever to the full-load position. Apply the (determined) pressure or vacuum to the aneroid box.

The resulting reduction in travel from the full-load control-rod travel value must comply with the value on the reverse of the Test Specification Sheet.

Correct by means of shims (148).

**Checking:**

For checking point see Test Specification Sheet.

**Example for vacuum:**

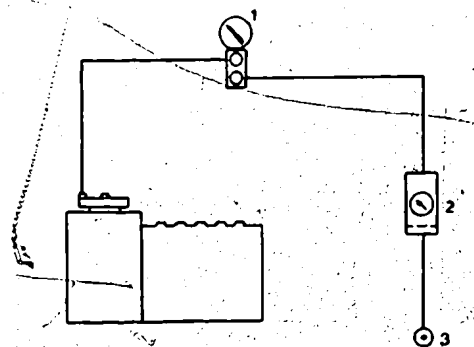
|                                       |            |             |
|---------------------------------------|------------|-------------|
| Atmospheric pressure                  | 1000 mbar  | (750 mm Hg) |
| Checking point<br>(absolute pressure) | - 913 mbar | (685 mm Hg) |
| Required vacuum,<br>setting value     | 87 mbar    | ( 65 mm Hg) |

The example for gauge pressure is analogous.  
If the reduction in travel value is outside the specified tolerance, the ADA aneroid box must be replaced.

Before fitting a new aneroid box, check the pin-projection dimension.

Repeat the test with the aneroid box.

The remaining working steps are described as from Section 6 onwards.



**Connection schematic**

- 1 = Setting throttle with pressure gauge
- 2 = Pressure-reducing valve (maintenance unit)
- 3 = Compressed-air connection

**5.2 Test and adjust the governor with ALDA aneroid box fitted**

Fit the ALDA aneroid box, together with the "selected by measurement" shims (148). (see Repair Instructions VDT-W 420/100 En, Suppl. 1).

Tighten the union nut (52/2) with a torque of 50 ... 70 Nm (5 ... 7 kgf.m).

**5.2.1 Connections for testing**

Ascertain the exact atmospheric pressure (weather bureau, mercury barometer).

**Calculate the maximum pressure:**

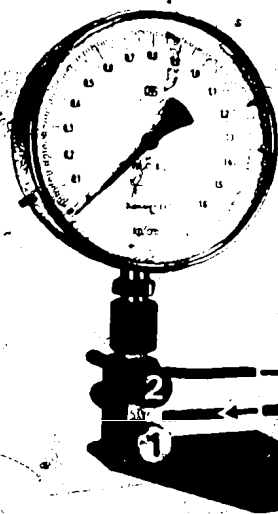
**Example:**

|                                                                 |           |              |
|-----------------------------------------------------------------|-----------|--------------|
| Maximum absolute pressure according to Test Specification Sheet | 1733 mbar | (1300 mm Hg) |
| Ascertained atmospheric pressure                                | 995 mbar  | ( 746 mm Hg) |
| Maximum pressure                                                | 738 mbar  | ( 554 mm Hg) |

Set the maximum pressure at the pressure-reducing valve.

Connect the lower connection of the setting throttle with the pressure-reducing valve.

Connect the top connection of the setting throttle with the ALDA fitting.



1 = Adjusting screw for setting the various pressures

2 = Screw plug for the ALDA fitting

### 5.2.2 Test steps:

#### Test point ④ with manifold pressure

Move the control lever up against the full-load stop.

The pressures given on the reverse side of the Test Specification Sheet are absolute pressures.

In order to check the ALDA aneroid box, the difference in pressure to the prevailing atmospheric pressure (barometric pressure) must be calculated.

Apply this pressure difference to the aneroid box.



#### Example:

|                                                         |            |             |
|---------------------------------------------------------|------------|-------------|
| Absolute pressure according to Test Specification Sheet | 1087 mbar  | (800 mm Hg) |
| Prevailing atmospheric pressure                         | - 995 mbar | (746 mm Hg) |
| Difference in pressure                                  | 72 mbar    | ( 54 mm Hg) |

Apply this pressure difference to the aneroid box.

Drive the fuel-injection pump at the specified speed.

Correction of the fuel delivery is carried out with the correction screw on the ALDA aneroid box.

#### Test point ④

Calculate the pressure required.

#### Example:

|                                                         |            |              |
|---------------------------------------------------------|------------|--------------|
| Absolute pressure according to Test Specification Sheet | 1733 mbar  | (1300 mm Hg) |
| Prevailing atmospheric pressure                         | - 995 mbar | ( 746 mm Hg) |
| Difference in pressure                                  | 738 mbar   | ( 554 mm Hg) |

Apply this pressure difference to the aneroid box.

Move the control lever to the full-load position. Drive the fuel-injection pump at the specified speed.

The specified control-rod travel must be reached. Correction is by means of a new aneroid box or new diaphragm spring (132). Use the compensating washers (133 and 141) again.

#### Test point ⑤

For the required pressure, see test point ④. If necessary, replace the spring capsule (30).

If the spring capsule is replaced, this necessitates the readjustment of the governor.

#### Test point ⑥

For the required pressure, see test point ④.

Correction as per test point 4.10.

#### Test point ⑦

Calculate the required pressure.

|                                                         |            |             |
|---------------------------------------------------------|------------|-------------|
| Absolute pressure according to Test Specification Sheet | 1000 mbar  | (750 mm Hg) |
| Prevailing atmospheric pressure                         | - 995 mbar | (746 mm Hg) |
| Difference in pressure                                  | 5 mbar     | ( 4 mm Hg)  |

Apply this pressure difference to the aneroid box.

In case the calculation results in a vacuum being necessary, this fact is to be ignored. Simply carry out the test without pressure.

Move the control lever to the idle position.

If necessary, correct the control-rod travel or the injected fuel quantity with the lower adjustment screw (28).

#### Test point ⑧

For the required pressure, see test point ⑤.

Carry out correction at the idle-speed auxiliary spring (70).

## 6. Final work

Fit the rear closing cover (80) together with a new gasket, connect the pneumatic shutoff device (if fitted) to the control rod.

The fastening screws for the closing cover (52) must not be released again.

Check the shutoff device for correct functioning: Check with vacuum, setting value 500 mbar (375 mm Hg). The pneumatic shutoff device must now pull the control rod to the travel position "0".

Remove the fuel-injection pump from the test bench.

Close off the oil-inlet line and oil-return line (or oil-return bore) on the side of the pump fitted with the cover plate, using, for instance, screw plugs 1 900 508 003. In the case of an oblong hole, use a suitably shaped rubber plug.

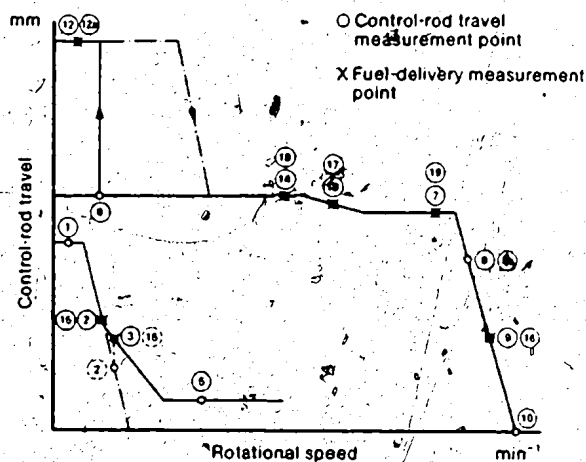
Screw a connector fitting (to be user-manufactured) into the thread in the first roller tappet (bore for prestroke measurement). Close off the pneumatic shutoff device if one is fitted. Neither the ventilation pipe of the ADA aneroid box, or the connection fitting of the ALDA are to be closed when the check is carried out for leaks.

Test pressure (gauge pressure): 0.5 bar (0.5 kgf/cm<sup>2</sup>).

In order to check the diaphragm for leaks, slip a hose over the connection fitting and immerse the other end in an oil bath. No air is to escape from the hose.

Apply the lead seals to the fuel-injection pump, the governor, and the aneroid box.

## 8. Governor characteristic curve with measurement points



## 7. Tightening torques

| Item No. | Designation              | Nm        | kgf.m       |
|----------|--------------------------|-----------|-------------|
| 4        | Hexagon nut              | 3 ... 4   | 0.3 ... 0.4 |
| 21 (20)  | Union nut or hexagon nut | 15 ... 17 | 1.5 ... 1.7 |
| 27       | Hexagon nut              | 6 ... 9   | 0.6 ... 0.9 |
| 31       | Round nut                | 30 ... 35 | 3.0 ... 3.5 |
| 43       | Hexagon nut              | 7 ... 9   | 0.7 ... 0.9 |
| 45       | Hexagon nut              | 20 ... 23 | 2.0 ... 2.3 |
| 50       | Screw plug               | 6 ... 8   | 0.6 ... 0.8 |
| 52/2     | Union nut                | 50 ... 70 | 5.0 ... 7.0 |
| 54       | Fillister-head screw     | 3 ... 5   | 0.3 ... 0.5 |
| 93       | Round nut                | 13 ... 15 | 1.3 ... 1.5 |

